WHAT IS CLAIMED IS:

1. A computer-implemented method of designing a set of experiments to be performed with a set of resources, the method comprising:

providing a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the set of constraints including one or more experimental constraints representing limitations on operations that can be performed with the set of resources;

generating a plurality of configurations based on the parameters and the experimental constraints, each configuration including a plurality of experimental points, each point having a set of values for the parameters;

selecting a configuration from the plurality of configurations; and

defining a set of experiments based on the selected configuration.

2. The method of claim 1, wherein:

providing a set of constraints includes providing one or more experiment lattices, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed.

3. The method of claim 2, wherein:

the lattice points represent locations on a substrate.

4. The method of claim 2, wherein:

providing a set of constraints includes providing a set of one or more patterns, the patterns representing the application of parameters to one or more lattice points of an experiment lattice under a set of experimental constraints, the experimental constraints for a given pattern being represented by a set of attributes; and

generating a plurality of configurations includes:

a) generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combining the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location.

5. The method of claim 4, wherein:

the patterns include one or more device patterns having attributes representing constraints associated with one or more devices for performing operations at one or more locations represented by lattice points of the experiment lattice.

6. The method of claim 5, wherein:

the operations include process steps for applying parameters at the locations.

7. The method of claim 6, wherein:

the process steps include depositing materials at one or more locations.

8. The method of claim 6, wherein:

the process steps include subjecting materials at one or more locations to processing conditions.

9. The method of claim 5, wherein:

the device pattern attributes for one or more device patterns include one or more device geometry attributes specifying a geometry in which a parameter will be applied to a substrate.

10. The method of claim 9, wherein:

the device geometry attributes include a thickness attribute representing a quantity of the parameter to be applied.

11. The method of claim 5, wherein:

one or more of the device patterns represent openings in a mask for exposing locations on a substrate.

12. The method of claim 5, wherein:

one or more of the device patterns represent openings in a shutter mask system for exposing locations on a substrate.

13. The method of claim 5, wherein:

one or more of the device patterns represent a set of dispensing tips for delivering materials to locations on a substrate.

14. The method of claim 5, wherein:

the plurality of pattern instances includes a plurality of device pattern instances specifying amounts of one or more materials to be deposited at locations on a substrate.

15. The method of claim 4, wherein:

providing a set of constraints includes providing one or more component patterns representing an arrangement of materials to be used in performing a set of experiments; and

generating a plurality of pattern instances includes superimposing the pattern instances with the component patterns, such that the pattern instances represent the application of the arrangement of materials to lattice points of the experiment lattice.

16. The method of claim 15, wherein:

the component patterns include a component pattern representing a library lattice for a parent library of materials to be used in performing a set of experiments.

17. The method of claim 4, wherein:

combining the pattern instances includes superimposing a plurality of pattern instances with one or more experiment lattices.

18. The method of claim 1, wherein:

each configuration in the plurality of configurations represents a set of experiments that can be performed with the set of resources.

19. The method of claim 4, wherein:

generating a plurality of configurations includes repeating the steps of generating a plurality of pattern instances and combining the pattern instances.

20. The method of claim 19, wherein:

generating a plurality of configurations includes generating a plurality of sets of pattern instances by varying the number and/or attribute values of pattern instances.

21. The method of claim 4, wherein:

generating a plurality of configurations includes generating a first configuration and subsequently generating a sequence of second configurations, each of the second configurations being generated by adding a pattern instance to a preceding configuration in the sequence, removing a pattern instance from a preceding configuration in the sequence, or changing an attribute value for an attribute of a pattern instance in a preceding configuration in the sequence.

22. The method of claim 21, wherein:

generating a first configuration includes generating a pseudo-random configuration.

23. The method of claim 4, wherein:

selecting an configuration from the plurality of configurations includes calculating a figure of merit for each of the configurations and applying a selection rule to the calculated figures of merit.

24. The method of claim 23, wherein:

calculating a figure of merit for a configuration includes comparing one or more of the parameter space points for the experimental configuration with a set of sampling requirements for a desired set of experiments.

25. The method of claim 24, wherein:

the set of sampling requirements includes a set of target points representing a desired set of experiments.

26. The method of claim 25, wherein:

the selected configuration is required to include a point corresponding to each point in the set of target points.

27. The method of claim 25, wherein:

the figure of merit for a configuration is calculated as a function of a distance in the parameter space between points in the configuration and points in the set of target points.

28. The method of claim 27, wherein:

the figure of merit for a configuration is further calculated as a function of the resource cost to perform a set of experiments defined by the experimental points in the configuration.

29. The method of claim 28, wherein:

the resource cost for a configuration is determined as a function of the number of patterns from which the configuration was generated.

30. The method of claim 1, wherein:

generating a plurality of configurations and selecting a configuration includes performing an optimization process.

31. The method of claim 30, wherein:

the optimization process is selected from the group consisting of Monte Carlo processes, simplex processes, conjugate gradient processes and genetic algorithm processes.

32. The method of claim 30, wherein:

performing an optimization process includes performing a Monte Carlo optimization process based on simulated annealing, parallel tempering, or a combination thereof.

33. The method of claim 4, wherein:

combining the pattern instances includes defining a sequence of pattern instances, the points in the configuration being defined in part by order information derived from the sequence.

34. The method of claim 33, wherein:

generating a plurality of configurations includes generating a first configuration and subsequently generating a sequence of second configurations, each of the second configurations being generated by adding a pattern instance to a preceding configuration in the sequence, removing a pattern instance from a preceding configuration in the sequence, changing an attribute value for an attribute of a pattern instance in a preceding configuration in the sequence, or changing the position of a pattern instance in the sequence.

35. The method of claim 33, wherein:

selecting a configuration includes identifying an optimum sequence of events for the set of experiments.

36. The method of claim 4, wherein:

the set of patterns includes patterns representing alternate applications of parameters to lattice points of an experiment lattice, the set of patterns including a first pattern defined by a first set of attributes and a second pattern defined by a second set of attributes, the second set of attributes differing from the first set of attributes in at least one attribute;

generating a plurality of configurations includes combining instances of the first pattern to generate a first configuration and combining instances of the second pattern to generate a second configuration; and

selecting a configuration includes identifying an optimum pattern from the first and second patterns.

37. The method of claim 4, wherein:

the one or more experiment lattices include a first experiment lattice representing a first arrangement in which a set of experiments could be performed and a second experiment lattice representing a second arrangement in which the set of experiments could be performed;

generating a plurality of configurations includes superimposing pattern instances with the first experiment lattice to generate a first configuration and superimposing pattern instances with the second experiment lattice to generate a second configuration; and

selecting a configuration includes identifying an optimum experiment lattice from the first and second experiment lattices.

38. The method of claim 15, wherein:

the one or more component patterns include a first component pattern representing a first arrangement of materials that could be used in performing the set of experiments and a second arrangement of materials that could be used in performing the set of experiments;

generating a plurality of configurations includes generating a first configuration based on the first component pattern and a second configuration based on the second component pattern; and

selecting a configuration includes identifying an optimum component pattern from the first and second component patterns.

39. The method of claim 1, wherein:

defining the set of experiments based on the selected configuration includes introducing a change to the selected configuration and defining the set of experiments based on the changed configuration.

40. The method of claim 1, further comprising:

outputting electronic data representing a design for the set of experiments.

41. A computer-implemented method of designing a set of experiments to be performed with a set of resources, the method comprising:

providing a set of parameters, one or more experiment lattices, and one or more patterns, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed, and each pattern representing the application of a parameter to one or more lattice points of an experiment lattice under a set of experimental constraints

representing limitations on operations that can be performed with the set of resources, the experimental constraints for a given pattern being represented by a set of attributes;

generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice;

combining the pattern instances to generate a set of experimental points, each point having a set of values for the parameters, the parameter values for a point in the configuration being based on the parameter values specified by the combined pattern instances for a corresponding lattice location; and

defining a set of experiments based on the experimental points.

42. A computer-implemented method of designing a set of experiments to be performed with a set of resources, the method comprising:

providing a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the set of constraints including a set of target points representing a desired set of experiments, one or more experiment lattices and one or more patterns, each of the set of target points having a set of parameters values defining a position in the parameter space, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed, the patterns representing the application of parameters to one or more lattice points of an experiment lattice under a set of experimental constraints representing limitations on operations that can be performed with the set of resources, the experimental constraints for a given pattern being represented by a set of attributes;

generating a plurality of configurations based on the parameters and the constraints, each configuration including a plurality of experimental points, each point having a set of values for the parameters, each configuration being generated by:

a) generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combining the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location. each configuration including a plurality of experimental points, each point having a set of values for the parameters;

comparing the experimental points of the configurations to the set of target points;

selecting a configuration from the plurality of configurations based on the comparing; and

defining a set of experiments based on the selected configuration.

43. A computer-implemented method of designing a set of experiments to be performed with a set of resources, the method comprising:

providing a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the set of constraints including a set of target points representing a desired set of experiments, one or more experiment lattices and a plurality of patterns, each of the set of target points having a set if parameters values defining a position in the parameter space, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed, the patterns representing alternate applications of parameters to lattice points of an experiment lattice under sets of experimental constraints representing limitations on operations that can be performed with the set of resources, the experimental constraints for a given pattern being represented by a set of attributes, the set of patterns including a first pattern defined by a first set of attributes and a second pattern defined by a second set of attributes, the second set of attributes differing from the first set of attributes in at least one attribute;

generating a plurality of configurations based on the parameters and the constraints, each configuration including a plurality of experimental points, each point having a set of values for the parameters, each configuration being generated by:

a) generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combining the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location. each configuration including a plurality of experimental points, each point having a set of values for the parameters;

comparing the experimental points of the configurations to the set of target points;

selecting a configuration from the plurality of configurations based on the comparing; and

defining a set of experiments based on the selected configuration;

wherein the plurality of configurations includes one or more first configurations generated by combining instances of the first pattern and one or more second configurations generated by combining instances of the second pattern, and selecting a configuration includes identifying an optimum pattern from the first and second patterns.

44. A computer program product on a computer-readable medium for designing a set of experiments to be performed with a set of resources, the program comprising instructions operable to cause a programmable processor to:

provide a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the set of constraints including one or more experimental constraints representing limitations on operations that can be performed with the set of resources;

generate a plurality of configurations based on the parameters and the constraints, each configuration including a plurality of experimental points, each point having a set of values for the parameters;

select a configuration from the plurality of configurations; and

define a set of experiments based on the selected configuration.

45. The computer program product of claim 44, wherein:

the set of constraints defines one or more experiment lattices, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed.

46. The computer program product of claim 45, wherein:

the lattice points represent locations on a substrate.

47. The computer program product of claim 45, wherein:

the set of constraints defines a set of one or more patterns, the patterns representing the application of parameters to one or more lattice points of an experiment lattice under a set of experimental constraints, the experimental constraints for a given pattern being represented by a set of attributes; and

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to:

a) generate a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combine the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location.

48. The computer program product of claim 47, wherein:

the patterns include one or more device patterns having attributes representing constraints associated with one or more devices for performing operations at one or more locations represented by lattice points of the experiment lattice.

49. The computer program product of claim 48, wherein:

the operations include process steps for applying parameters at the locations.

50. The computer program product of claim 49, wherein:

the process steps include depositing materials at one or more locations.

51. The computer program product of claim 49, wherein:

the process steps include subjecting materials at one or more locations to processing conditions.

52. The computer program product of claim 48, wherein:

the device pattern attributes for one or more device patterns include one or more device geometry attributes specifying a geometry in which a parameter will be applied to a substrate.

53. The computer program product of claim 52, wherein:

the device geometry attributes include a thickness attribute representing a quantity of the parameter to be applied.

54. The computer program product of claim 48, wherein:

one or more of the device patterns represent openings in a mask for exposing locations on a substrate.

55. The computer program product of claim 48, wherein:

one or more of the device patterns represent openings in a shutter mask system for exposing locations on a substrate.

56. The computer program product of claim 48, wherein:

one or more of the device patterns represent a set of dispensing tips for delivering materials to locations on a substrate.

57. The computer program product of claim 48, wherein:

the plurality of pattern instances includes a plurality of device pattern instances specifying amounts of one or more materials to be deposited at locations on a substrate.

58. The computer program product of claim 47, wherein:

the set of constraints defines one or more component patterns representing an arrangement of materials to be used in performing a set of experiments; and

the instructions operable to cause a programmable processor to generate a plurality of pattern instances include instructions operable to cause a programmable processor to superimpose the pattern instances with the component patterns, such that the pattern

instances represent the application of the arrangement of materials to lattice points of the experiment lattice.

59. The computer program product of claim 58, wherein:

the component patterns include a component pattern representing a library lattice for a parent library of materials to be used in performing a set of experiments.

60. The computer program product of claim 47, wherein:

the instructions operable to cause a programmable processor to combine the pattern instances include instructions operable to cause the programmable processor to superimpose a plurality of pattern instances with one or more experiment lattices.

61. The computer program product of claim 44, wherein:

each configuration in the plurality of configurations represents a set of experiments capable of being performed with the set of resources.

62. The computer program product of claim 47, wherein:

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to repeat the steps of generating a plurality of pattern instances and combining the pattern instances.

63. The computer program product of claim 62, wherein:

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to generate a plurality of sets of pattern instances by varying the number and/or attribute values of pattern instances.

64. The computer program product of claim 47, wherein:

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to generate a first configuration and subsequently generate a sequence of second configurations, each of the second configurations being generated by adding a pattern instance to a preceding

configuration in the sequence, removing a pattern instance from a preceding configuration in the sequence, or changing an attribute value for an attribute of a pattern instance in a preceding configuration in the sequence.

65. The computer program product of claim 64, wherein:
the first configuration includes a pseudo-random configuration.

66. The computer program product of claim 47, wherein:
the instructions operable to cause a programmable processor to select an configuration from the plurality of configurations include instructions operable to cause a programmable processor to calculate a figure of merit for each of the configurations and apply a selection rule to the calculated figures of merit.

67. The computer program product of claim 66, wherein:
the instructions operable to cause a programmable processor to calculate a figure of merit for a configuration include instructions operable to cause a programmable processor to compare one or more of the parameter space points for the experimental configuration with a set of sampling requirements for a desired set of experiments.

68. The computer program product of claim 67, wherein:
the set of sampling requirements includes a set of target points representing a desired set of experiments.

69. The computer program product of claim 68, wherein:
the selected configuration is required to include a point corresponding to each point in the set of target points.

70. The computer program product of claim 68, wherein:
the figure of merit for a configuration is calculated as a function of a distance in the parameter space between points in the configuration and points in the set of target points.

71. The computer program product of claim 70, wherein:

the figure of merit for a configuration is further calculated as a function of the resource cost to perform a set of experiments defined by the experimental points in the configuration.

72. The computer program product of claim 71, wherein:

the resource cost for a configuration is determined as a function of the number of patterns from which the configuration was generated.

73. The computer program product of claim 44, wherein:

the instructions operable to cause a programmable processor to generate a plurality of configurations and select a configuration include instructions operable to cause a programmable processor to perform an optimization process.

74. The computer program product of claim 73, wherein:

the optimization process is selected from the group consisting of Monte Carlo processes, simplex processes, conjugate gradient processes and genetic algorithm processes.

75. The computer program product of claim 73, wherein:

the optimization process includes a Monte Carlo optimization process based on simulated annealing, parallel tempering, or a combination thereof.

76. The computer program product of claim 47, wherein:

the instructions operable to cause a programmable processor to combine the pattern instances include instructions operable to cause a programmable processor to define a sequence of pattern instances, the points in the configuration being defined in part by order information derived from the sequence.

77. The computer program product of claim 76, wherein:

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to generate a first configuration and subsequently generate a sequence of second configurations, each of the second configurations being generated by adding a pattern instance to a preceding

configuration in the sequence, removing a pattern instance from a preceding configuration in the sequence, changing an attribute value for an attribute of a pattern instance in a preceding configuration in the sequence, or changing the position of a pattern instance in the sequence.

78. The computer program product of claim 76, wherein:

the instructions operable to cause a programmable processor to select a configuration include instructions operable to cause a programmable processor to identify an optimum sequence of events for the set of experiments.

79. The computer program product of claim 47, wherein:

the set of patterns includes patterns representing alternate applications of parameters to lattice points of an experiment lattice, the set of patterns including a first pattern defined by a first set of attributes and a second pattern defined by a second set of attributes, the second set of attributes differing from the first set of attributes in at least one attribute;

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to combine instances of the first pattern to generate a first configuration and combine instances of the second pattern to generate a second configuration; and

the instructions operable to cause a programmable processor to select a configuration include instructions operable to cause a programmable processor to identify an optimum pattern from the first and second patterns.

80. The computer program product of claim 47, wherein:

the one or more experiment lattices include a first experiment lattice representing a first arrangement in which a set of experiments could be performed and a second experiment lattice representing a second arrangement in which the set of experiments could be performed;

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to superimpose pattern instances with the first experiment lattice to generate a first configuration and superimpose pattern instances with the second experiment lattice to generate a second configuration; and

the instructions operable to cause a programmable processor to select a configuration include instructions operable to cause a programmable processor to identify an optimum experiment lattice from the first and second experiment lattices.

81. The computer program product of claim 58, wherein:

the one or more component patterns include a first component pattern representing a first arrangement of materials that could be used in performing the set of experiments and a second arrangement of materials that could be used in performing the set of experiments;

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to generate a first configuration based on the first component pattern and a second configuration based on the second component pattern; and

the instructions operable to cause a programmable processor to select a configuration include instructions operable to cause a programmable processor to identify an optimum component pattern from the first and second component patterns.

82. The computer program product of claim 44, wherein:

the instructions operable to cause a programmable processor to define the set of experiments based on the selected configuration include instructions operable to cause a programmable processor to introduce a change to the selected configuration and define the set of experiments based on the changed configuration.

83. The compute program product of claim 44, further comprising instructions operable to cause a programmable processor to:

output electronic data representing a design for the set of experiments.

84. A computer program product on a computer-readable medium for designing a set of experiments to be performed with a set of resources, the program comprising instructions operable to cause a programmable processor to

provide a set of parameters, one or more experiment lattices, and one or more patterns, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, each experiment lattice including one or

more lattice points and representing an arrangement in which experiments in a set of experiments will be performed, and each pattern representing the application of a parameter to one or more lattice points of an experiment lattice under a set of experimental constraints representing limitations on operations that can be performed with the set of resources, the experimental constraints for a given pattern being represented by a set of attributes;

generate a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

combine the pattern instances to generate a set of experimental points, each point having a set of values for the parameters, the parameter values for a point in the configuration being based on the parameter values specified by the combined pattern instances for a corresponding lattice location; and

define a set of experiments based on the experimental points.

85. A system for performing a set of experiments, the system comprising:

one or more devices configured to apply a plurality of parameters to a plurality of locations on a substrate, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the application of parameters to the substrate locations being defined by one or more patterns, each pattern representing the application of a parameter to one or more substrate locations under a set of experimental constraints representing limitations on operations that can be performed with the devices, the experimental constraints for a given pattern being represented by a set of attributes; and

a programmable processor configured to:

a) generate a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of the parameter to be applied at one or more locations on the substrate;

b) combine the pattern instances to generate a configuration, each configuration including a plurality of experimental points, each point having a set of values for the parameters, the parameter values for a point in the configuration being based

on the quantities specified by the combined pattern instances for a corresponding substrate location;

c) define a design for a set of experiments based on the configuration, the design including for each experiment in the set of experiments a set of parameter values quantifying each of a plurality of the parameters to be applied in the experiment; and

d) instruct the devices to carry out the set of experiments according to the design.

86. The system of claim 85, wherein the programmable processor is further configured to:

provide a set of target points representing a desired set of experiments, the set of target points including a plurality of points in a parameter space defined by a plurality of experimental parameters, each of the points in the set of target points having a set of parameter values;

generate a plurality of configurations by generating a plurality of sets of pattern instances and combining the instances of each set of the pattern instances to generate an configuration, each configuration including a plurality of points in the parameter space, each of the plurality of points in the configuration having a set of parameter values;

select an configuration from the plurality of experimental configurations based on a comparison of the points in the configurations to the set of target points; and

define the design for the set of experiments based on the points in the selected configuration.

87. The method of claim 1, wherein:

the set of constraints includes a first set of experimental constraints representing limitations on operations that can be performed with a first set of resources and a second set of experimental constraints representing limitations on operations that can be performed with a second set of resources; and

generating a plurality of configurations includes generating a first configuration based on the first set of experimental constraints and a second configuration based on the second set of experimental constraints; and

selecting a configuration includes identifying an optimum set of resources from the first and second sets of resources.

88. The computer program product of claim 44, wherein:

the set of constraints includes a first set of experimental constraints representing limitations on operations that can be performed with a first set of resources and a second set of experimental constraints representing limitations on operations that can be performed with a second set of resources;

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to generate a first configuration based on the first set of experimental constraints and a second configuration based on the second set of experimental constraints; and

the instructions operable to cause a programmable processor to select a configuration include instructions operable to cause a programmable processor to identify an optimum set of resources from the first and second sets of resources.

89. A computer-implemented method of designing a set of experiments to be performed with a set of resources, the method comprising:

providing a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the set of constraints including a set of sampling requirements for a set of experiments, one or more experiment lattices and one or more patterns, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed, the patterns representing the application of parameters to one or more lattice points of an experiment lattice under a set of experimental constraints representing limitations on operations that can be performed with the set of resources, the experimental constraints for a given pattern being represented by a set of attributes;

generating a plurality of configurations based on the parameters and the constraints, each configuration including a plurality of experimental points, each point having a set of values for the parameters, each configuration being generated by:

a) generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combining the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location. each configuration including a plurality of experimental points, each point having a set of values for the parameters;

comparing the experimental points of the configurations to the set of sampling requirements;

selecting a configuration from the plurality of configurations based on the comparing; and

defining a set of experiments based on the selected configuration.

90. The method of claim 89, wherein:

the set of sampling requirements specifies one or more of a number of sample points, a sampling precision, or a threshold distance from a set of target points.

91. A computer-implemented method of designing a set of experiments to be performed with a set of resources, the method comprising:

providing a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied in a set of experiments and representing axes defining a parameter space, the set of constraints including a set of sampling requirements for a set of experiments, one or more experiment lattices and a plurality of patterns, each experiment lattice including one or more lattice points and representing an arrangement in which experiments in a set of experiments will be performed, the patterns representing alternate applications of parameters to lattice points of an experiment lattice under sets of experimental constraints representing limitations on operations that can be performed with the set of resources, the experimental constraints for a given pattern being represented by a set of attributes, the set of patterns including a first pattern defined by a first set of attributes

and a second pattern defined by a second set of attributes, the second set of attributes differing from the first set of attributes in at least one attribute;

generating a plurality of configurations based on the parameters and the constraints, each configuration including a plurality of experimental points, each point having a set of values for the parameters, each configuration being generated by:

a) generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combining the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location. each configuration including a plurality of experimental points, each point having a set of values for the parameters;

comparing the experimental points of the configurations to the set of sampling requirements;

selecting a configuration from the plurality of configurations based on the comparing; and

defining a set of experiments based on the selected configuration;

wherein the plurality of configurations includes one or more first configurations generated by combining instances of the first pattern and one or more second configurations generated by combining instances of the second pattern, and selecting a configuration includes identifying an optimum pattern from the first and second patterns.

92. A computer-implemented method of generating a design for a library of materials to be prepared with a set of resources, the method comprising:

providing a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied during preparation of the library of materials and representing axes defining a parameter space, the set of constraints including one or more experiment lattices, each experiment lattice including one or more lattice points and representing one or more substrates on which the library of materials is to be prepared, the set of constraints also

including one or more experimental constraints representing limitations on operations that can be performed with the set of resources;

generating a plurality of configurations based on the parameters and the experimental constraints, each configuration including a plurality of points, each point having a set of values for the parameters and being assigned to a lattice point of an experiment lattice;

selecting a configuration from the plurality of configurations; and

generating a library design based on the selected configuration, the library design including a plurality of points, each point representing a material to be included in the library of materials and having a set of values for the parameters, the set of values being derived from the values for the selected configuration.

93. The method of claim 92, wherein:

providing a set of constraints includes providing a set of one or more patterns, the patterns representing the application of parameters to one or more lattice points of an experiment lattice under a set of experimental constraints, the experimental constraints for a given pattern being represented by a set of attributes; and

generating a plurality of configurations includes:

a) generating a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combining the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location.

94. A computer program product on a computer-readable medium for designing a set of experiments to be performed with a set of resources, the program comprising instructions operable to cause a programmable processor to:

provide a set of parameters and a set of constraints, the parameters including a plurality of factors to be varied during preparation of the library of materials and representing axes defining a parameter space, the set of constraints including one or more experiment

lattices, each experiment lattice including one or more lattice points and representing one or more substrates on which the library of materials is to be prepared, the set of constraints also including one or more experimental constraints representing limitations on operations that can be performed with the set of resources;

generate a plurality of configurations based on the parameters and the experimental constraints, each configuration including a plurality of points, each point having a set of values for the parameters and being assigned to a lattice point of an experiment lattice;

select a configuration from the plurality of configurations; and

generate a library design based on the selected configuration, the library design including a plurality of points, each point representing a material to be included in the library of materials and having a set of values for the parameters, the set of values being derived from the values for the selected configuration.

95. The computer program product of claim 94, wherein:

the set of constraints includes a set of one or more patterns, the patterns representing the application of parameters to one or more lattice points of an experiment lattice under a set of experimental constraints, the experimental constraints for a given pattern being represented by a set of attributes; and

the instructions operable to cause a programmable processor to generate a plurality of configurations include instructions operable to cause a programmable processor to:

a) generate a plurality of instances of one or more of the patterns, each pattern instance being defined by a set of attribute values for the attributes defining the pattern, the set of attribute values specifying a quantity of a parameter to be applied at one or more lattice points of an experiment lattice; and

b) combine the pattern instances to generate a configuration, such that the parameter values for a point in the configuration are based on the parameter values specified by the combined pattern instances for a corresponding lattice location.